CLAIMS:

1. A method of controlling a periodic product waveform produced by a system having a linear transfer function in response to a drive signal so as to match a target waveform, comprising the steps of:

a) sensing at least one period of the product waveform and generating control input digital data representative of said waveform;

b) performing a Fourier transform on said control input digital data to generate control input Fourier coefficients corresponding to said product waveform;

c) performing a Fourier transform on target digital data representative of a period of said target waveform to generate target Fourier coefficients corresponding to said target waveform;

d) comparing said control input Fourier coefficients and said target Fourier coefficients to generate a set of error coefficients;

e) maintaining control output Fourier coefficients for use in generating said drive signal for said system;

f) modifying said control output Fourier coefficients in accordance with said error coefficients to generate improved control output Fourier coefficients;

g) performing an inverse Fourier transform on said improved control output Fourier coefficients to generate control output digital data representative of said drive signal for said system; and

h) using said control output digital data to produce said drive signal for a subsequent period of the periodic product waveform.

2. An analogue system producing a desired periodic

waveform from a periodic drive signal to the system, the system having a linear transfer function, wherein the system comprises:

a) a sensor producing a control input signal having a predetermined relationship to said product waveform;

b) an A/D converter generating control input digital data representative of a period of said product signal;

c) a source of target digital data representative of a period of a target waveform having said predetermined relationship to said desired waveform;

d) a digital signal processor receiving said control input digital data and said target digital data and generating control output digital data representative of a period of said drive signal to the system; and

e) a D/A converter generating said drive signal from said control output digital data;

f) said digital signal processor being arrange to

i) perform a Fourier transform on said control input digital data to generate control input Fourier coefficients corresponding to said control input waveform;

ii) perform a Fourier transform on said target digital data to generate target Fourier coefficients corresponding to said target waveform;

iii) compare said control input Fourier coefficients and said target Fourier coefficients;

iv) maintain control output Fourier coefficients for use in generating said control output digital data,

v) modify said control output Fourier coefficients in accordance with said error

coefficients to generate improved control output Fourier coefficients, and

vi) perform an inverse Fourier transform on said improved control output Fourier coefficients to generate said control output digital data.

3. A method of controlling the waveform of a periodically varying magnetic field, produced by a periodic current in a magnet winding, so as to match an intended field waveform, comprising the steps of:

a) sensing at least one period of the magnetic field and generating control input digital data representative of a control input waveform which is a predetermined function of said magnetic field waveform;

b) performing a Fourier transform on said control input digital data to generate control input Fourier coefficients corresponding to said control input waveform;

c) performing a Fourier transform on target digital data representative of a period of a target waveform which is said predetermined function of said intended field waveform, to generate target Fourier coefficients corresponding to said target waveform;

d) comparing said control input Fourier coefficients and said target Fourier coefficients to generate a set of error coefficients;

e) maintaining control output Fourier coefficients for use in generating a command current waveform for producing said periodic magnetic winding current;

f) modifying said control output Fourier coefficients in accordance with said error coefficients to generate improved control output Fourier coefficients;

g) performing an inverse Fourier transform on said improved control output coefficients to generate control output digital data representative of a control output waveform;

h) periodically generating said command current waveform from said control output digital data, said control output waveform being an inverse of said predetermined function of said command current waveform; and

i) amplifying said periodic command current waveform to produce said periodic magnetic winding current.

4. A method of controlling the waveform as claimed in Claim 3, in which said control input waveform is the derivative of said magnetic field waveform and said control output waveform is integrated in generating said command current waveform.

5. A method of controlling the waveform as claimed in Claim 4, wherein said periodically varying magnetic field is used to scan a charge particle beam and said target waveform represents an intended writing speed of the particle beam over a fixed target.

6. A scan controller for a charged particle beam scanner employing a periodically varying magnetic field produced by a periodic current in a magnet winding from a magnet current amplifier, the controller comprising:

a) a sensor producing a control input signal waveform having a predetermined relationship to said periodically varying magnetic field;

b) an A/D converter generating control input digital data representative of a period of said control input signal waveform;

c) a source of target digital data representative of

a period of a target waveform which is said predetermined function of a desired beam scan position waveform;

d) a digital signal processor receiving said control input digital data and said target digital data and generating control output digital data representative of a period of a control output waveform;

e) a D/A converter arranged to generate a periodic demand signal for output to the magnet current amplifier, said demand signal being an inverse of said predetermined function of said control output signal; and

f) said digital signal processor being arranged to

i) perform a Fourier transform on said control input digital data to generate control input Fourier coefficients corresponding to said control input signal waveform;

ii) perform a Fourier transform on said target digital data to generate target Fourier coefficients corresponding to said target waveform;

iii) compare said control input Fourier coefficients and said target Fourier coefficients to generate a set of error coefficients;

iv) maintain control output Fourier coefficients for use in generating said control output digital data,

v) modify said control output Fourier coefficients in accordance with said error coefficients to generate improved control output Fourier coefficients, and

vi) perform an inverse Fourier transform on said improved control output Fourier coefficients to generate said control output digital data.

7. A scan controller as claimed in Claim 6, wherein said sensor is a sense coil producing a voltage signal which is the derivative of said magnetic field.

8. A scan controller as claimed in Claim 7, wherein said target waveform represents the intended writing speed of the particle beam over a fixed target.

9. A method of controlling the periodic scanning field of a scanning system of a scanned beam ion implanter, comprising:

measuring the dosing rate of the beam at multiple positions over the scan,

determining from the measured dosing rates a target waveform which is a function of the scan speed waveform which should produce a desired distribution of said dosing rate over the scan,

producing, from said target waveform, a scan drive signal for the scanning system to effect a scanning field having a waveform corresponding to a function of said target waveform,

monitoring the scanning field to produce a feedback signal which is a function of the scanning field waveform such as to correspond to said target waveform,

comparing a period of said feedback signal with a period of said target waveform to produce an error signal representing the difference in the waveforms of said periods,

and modifying subsequent periods of said scan drive signal to reduce said error signal.